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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/501,240

03/30/2005

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EXAMINER

WU, IVES J

ART UNIT

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1797

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12/14/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/501,240	<b>Applicant(s)</b> BROK ET AL.	
	<b>Examiner</b> IVES WU	<b>Art Unit</b> 1797	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 05 October 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4,9,12-16,20 and 23-27 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4,9,12-16,20,23-27 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)         | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

### **DETAILED ACTION**

(1). Applicants' Request-for-Continued Examination (RCEX), Amendments and Remarks filed on 10/29/2009 have been received.

Claims 1 and 15 are amended. Claims 5-8, 10-11, 17-19 and 21-22 are cancelled.

New claims 24-27 are added.

An Office Action is presented in response to RCEX in the following.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

(2). **Claims 1-4, 9, 12-16, 20, 23-27** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In claim 1, it recites: in a single absorption stage. However, it is not explicitly supported in the Applicants' Specification. The recitation "in a zone" as in the instant Specification at page 7 is a broad recitation which may include several stages or columns. Thus not limiting to a single stage. This is a new matter rejection.

In claim 15, it recites: an absorbent liquid containing absorbed carbon dioxide and further containing between 15 and 45 parts by weight water, between 15 and 40 parts by weight sulfolane and between 30 and 60 parts by weight of an amine". However, it is not supported in Specification because the loaded solvent is not further disclosed for its compositions as claimed in the Applicants' Specification

The rest of claims are rejected due to their subordination.

### ***Claim Rejections - 35 USC § 103***

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

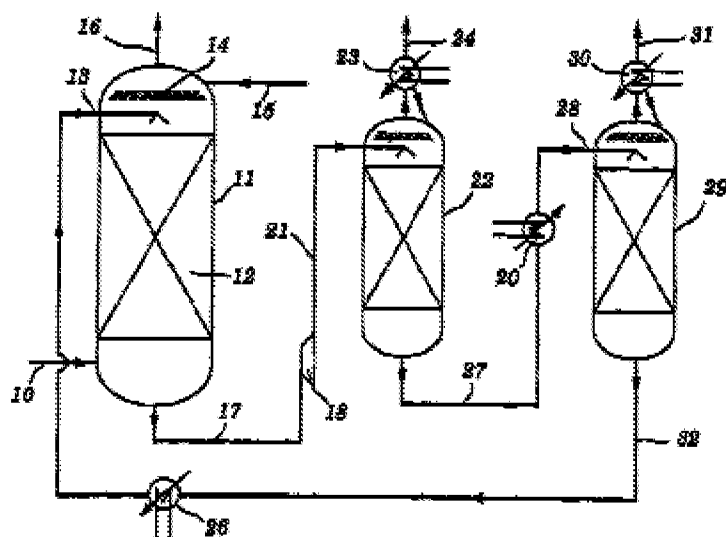
(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

(3). **Claims 1-4, 9, 12-16, 20, 23-27** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wagner et al (US 7276153B2) in view of Wagner et al (US 4997630), evidenced by Grossmann et al (US 6436174B1).

As to a process for the removal of carbon dioxide from a gas stream containing carbon dioxide by washing the gas stream in a single stage with an aqueous washing solution containing between 30 to 60 parts by weight of an amine selected from the group of amines consisting of MEA, DEA, TEA, DIPA and MDEA, further aqueous washing solution contains piperazine in an amount in the range of from 0.7 mol/l to 0.9 mol/l in **independent claim 1**, wherein the amine in aqueous washing solution is DIPA in **claim 25**, wherein the amine is DIPA in **claim 26**, wherein the amine is DIPA in **claim 27**, Wagner et al (US 7276153) disclose method for neutralizing a stream of hydrocarbon fluid (Title). In a process for de-acidifying a fluid hydrocarbon stream which comprises carbon dioxide and/or other acid gases as impurities, the fluid stream is brought into intimate contact with an absorption liquid in an absorption or extraction zone 12 (Abstract, line 1-5). Instead of the single-stage absorption device described here, a two-stage variant can also be used (Col. 6, line26-27).



**Fig. 1**

Process can be carried out using the most varied absorption liquids, aqueous amine solutions which comprise at least one amine being preferred as absorption liquids. Particularly preferably, alkanolamines such as monoethanolamine, diethanolamine, triethanolamine, diisopropanolamine (DIPA), aminoethoxyethanol, etc., are used. Very particularly preferably, the absorption liquid comprises methyldiethanolamine (MDEA), dimethylethanolamine or piperazine, as individual components or as a mixture of two or three of these components. When a tertiary amine is used, an activator, in particular piperazine or a derivative thereof can be used. The activator is generally used in an amount of from 0.05 to 3 mol, in particular from 0.1 to 2 mol, per 1 of absorption liquid (Col. 5, line 20-36). The amount of methyldiethanolamine in this case is from 30 to 70% by weight, in particular from 35 to 60% by weight, or from **40 to 60% by weight** based on weight of absorption liquid (Col. 5, line 38-42).

As to aqueous washing solution containing between 15 and 45 parts by weight water, between 15 and 40 parts by weight sulfolane wherein the parts by weights are based on the amounts of water, sulfolane and amine together being 100 parts by weight in **independent claim 1**, Wagner et al (US 7276153B2) disclose typical physical solvents to be cyclotetramethylene sulfone (sulfolane) and its derivatives, aliphatic acid amides, NMP (N-methylpyrrolidone), N-alkylated pyrrolidones and corresponding piperidones, methanol and mixtures of dialkyl ethers

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of polyethylene glycols (Col. 1, line 53-60). Wagner et al (US 7276153B2) **do not teach** the use of sulfolane with the weight ratio as claimed.

However, Wagner et al (US 4997630) **teach** removal of CO<sub>2</sub> and/or H<sub>2</sub>S from gases (Title). The aqueous absorption liquid containing from 20 to 70% by weight of MDEA can additionally contain a physical solvent. Examples of suitable physical solvents are N-methylpyrrolodone, tetramethylene sulfone, methanol. The physical solvent is present in the absorption liquid in general in an amount of from 1 to 60, preferably from 10 to 50, in particular from 20 to 40% by weight (Col. 2, line 44-54). The balance would be the water content.

The advantage of adding physical solvent is to increase the absorption rate as well as absorption capacity as well known in the art, also evidenced by Grossmann et al (US 6436174B1) that It is known to remove unwanted acidic gas constituents, such as CO<sub>2</sub> H<sub>2</sub> S or COS, from gases comprising these constituents by gas scrubbing, using aqueous or non-aqueous mixtures of organic solvents as absorption medium. In this operation, both physical and chemical solvents are used (Col. 1, line 16).

Therefore, it would have been obvious at time of the invention to add sulfolane in amount as taught by Wagner et al (US 4997630) in the absorption liquid of Wagner et al (US 7276153B2) in order to obtain the advantages cited above.

As to aqueous washing solution to gas ratio of from 1.0 to 10 (weight/weight) in **independent claim 1**, wherein the ratio of aqueous washing solution to gas is between 2 and 6 in **claim 24**, Wagner et al (US7276153B2) disclose, because of the slow reaction of carbon dioxide, the scrubbing process with tertiary alkanolamine solutions must be carried out using a high liquid/gas ratio at a correspondingly high solvent recirculation rate. Therefore, attempts have been made to increase the absorption rate of carbon dioxide in aqueous solutions of tertiary alkanolamines by adding further compounds which are termed activators or promoters (Col. 2, line 35-42). In absence of showing the criticality of the ratios, the optimized scrubbing liquid/gas ratio from 1 to 10 by weight in such known process render prima facie obviousness within one of ordinary skills in the art. *In re Boesch*, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980). It is also obvious to have the ratio of 1:1.

As to thereby obtaining an aqueous washing solution loaded with carbon dioxide, and a purified gas stream having a substantially reduced concentration of carbon dioxide, carbon

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dioxide loaded aqueous washing solution being substantially free of insoluble carbamates in **independent claim 1**, in view of the substantially identical scrubbing liquid disclosed by prior arts, and by Applicants, it appears that the absorption liquid of prior arts would be substantially free of insoluble carbamates, and a purified gas stream having a substantially reduced concentration of carbon dioxide, an aqueous scrubbing liquid loaded with carbon dioxide as claimed. Since USPTO does not have proper means for the experiments, the burden now is shifted to Applicants to prove otherwise.

As to gas stream being natural gas or synthesis gas in **claim 2**, Wagner et al (US 7276153B2) disclose hydrocarbon stream (Abstract).

As to gas stream including an amount of carbon dioxide to be between 1 and 45 mol%, an amount of hydrogen sulphide to be between 0 and 25 mol%, and an amount of COS to be between 0 and 2 mol% in **claim 3**, Wagner et al (US 4997630) disclose, the gases having a CO<sub>2</sub> content of in general from 1 to 90, preferably from 2 to 90, and in particularly from 5 to 60 mol%. In addition to the CO<sub>2</sub>, the gases can contain H<sub>2</sub>S as a further acidic gas, or can contain H<sub>2</sub>S alone (Col. 2, line 22-28). In any event, the amount of COS and H<sub>2</sub>S can be zero.

As to aqueous washing solution including an amount of water between 20 to 45 parts by wt, an amount of sulfolane between 20 to 35 parts by wt, and an amount of amine between 40 to 55 parts by wt, wherein the parts by weights are based on the amounts of water, sulfolane and amine together being 100 parts by weight in **claim 4**, the disclosure of Wagner et al (US 7276153) is incorporated herein by reference, the most subject matters as currently claimed, have been recited in applicants' claim 1, and have been discussed therein.

As to piperazine being in aqueous washing solution in amount in the range of from 0.6 to 0.8 mol/l in **claim 9**, the disclosure of Wagner et al (US 7276153) is incorporated herein by reference, the most subject matter as currently claimed, have been recited in applicants' claim 1, and have been discussed therein.

As to process being carried out at a temperature of at least 20 °C in **claim 12**, Wagner et al (US 4997630) disclose the 1<sup>st</sup> absorption stage at from 40 to 100° C (Abstract).

As to process also comprising a regeneration of the loaded solvent in **claim 13**, Wagner et al (US 4997630) disclose the laden absorption liquid obtained from 1<sup>st</sup> absorption stage to be regenerated by being let down in not less than 2 flash stages (Col. 3, line 32-53).

As to process to be carried out at a pressure between 25 to 90 bara in **claim 14**, Wagner et al (US 4997630) disclose, in general, pressure of from 5 to 110, preferably from 10 to 100, in particular from 20 to 90 bar are employed in the 1<sup>st</sup> and 2<sup>nd</sup> absorption stages, and pressures in these two stages may differ from one another (Col. 3, line 16-20).

As to the composition in an absorbent liquid containing absorbed carbon dioxide in **independent claim 15**, the disclosure of Wagner et al (US 7276153B2), Wagner et al (US4997630) is incorporated herein by reference, the most subject matters as currently claimed, have been recited in applicants' claim 1, and have been discussed therein. The loaded solvent (carbon dioxide containing) of prior arts would contain range of the compositions as claimed in view of the substantially identical process and absorption liquid.

As to absorbent liquid including an amount of water between 20 to 45 parts by wt, an amount of sulfolane between 20 to 35 parts by wt, and an amount of amine between 40 to 55 parts by wt, wherein the parts by weights are based on the amounts of water, sulfolane and amine together being 100 parts by weight in **claim 16**, the disclosure of Wagner et al is incorporated herein by reference, the most subject matters as currently claimed, have been recited in applicants' claim 4, and have been discussed therein.

As to absorbent liquid having piperazine in an amount in the range of from 0.6 to 0.8 mol/l in **claim 20**, the disclosure of Wagner et al is incorporated herein by reference, the most subject matter as currently claimed, have been recited in applicants' claim 9, and have been discussed therein.

As to amine to be MDEA in **claim 23**, Wagner et al (US 7276153) disclose an aqueous absorption liquid containing from 30 to 70 wt% of methyldiethanolamine (MDEA) (Col. 5, line 37-39).

### ***Response to Arguments***

(4). Applicant's arguments with respect to claim 1 for the amendments have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***



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Any inquiry concerning this communication or earlier communications from the examiner should be directed to IVES WU whose telephone number is (571)272-4245. The examiner can normally be reached on 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Examiner: Ives Wu

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Date: December 2, 2009

/Duane Smith/  
Supervisory Patent Examiner, Art Unit 1797